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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/712,351

11/13/2003

Xueping Xu

ATMI-685

1430

23448

7590

09/27/2005

EXAMINER

STEIN, STEPHEN J

INTELLECTUAL PROPERTY / TECHNOLOGY LAW

PO BOX 14329

RESEARCH TRIANGLE PARK, NC 27709

ART UNIT

PAPER NUMBER

1775

DATE MAILED: 09/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/712,351

Applicant(s)

XU ET AL.

Examiner

Stephen J. Stein

Art Unit

1775

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-120 is/are pending in the application.
- 4a) Of the above claim(s) 52-120 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-51 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 3/8/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-51, drawn to GaN material, wafer and electronic device, classified in class 428, subclass 698.
 - II. Claims 52-120, drawn to a vapor growth process, classified in class 117, subclass 84.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by the materially alternate process of using a single phase vapor growth technique.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Steven Hultquist on September 16, 2005 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-51. Affirmation of this election must be made by applicant in replying to this Office action. Claims 51-120 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 3 recites the limitation "GaN material according to claim 1". The limitation lacks antecedent basis in claim 1. If applicants intend to claim that the III-V nitride material in claim 1 is GaN, then it should be expressly claimed.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-3, 8, 10-13, 17-22, 26-37 and 41-51 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6,468,882 B2 (Motoki et al.).

Motoki teaches a rectangular shaped GaN (group III-V) single crystal wafer substrate having a low dislocation density grown on heteroepitaxial gallium arsenide substrate (See abstract and col. 4). Motoki further teaches that the GaN crystal wafers are rectangular substrates of about 25 mm x 30mm (area of 7.5 cm²) with a thickness of 0.7mm (700 micrometers) which are formed from a 2.5cm grown ingot and which are polished after slicing (col. 30, lines 56-67 and col. 31, lines 1-2). The reference still further teaches that the GaN has a

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dislocation density (ADD) of less than $1 \times 10^6 \text{ cm}^{-2}$ (See claim 15) and further teaches that the substrates can be used forming light emitting diodes or laser diodes (optoelectronic devices) (See column 1, lines 10-16). Motoki still further teaches that the planes (000n) having a normal parallel to the c-axis are called "C-plane" and that the (11-20) plane passes a positive 1 on the a-axis, a positive 1 on the b-axis and a negative half on the d-axis (See Figure 8).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 9, 14-16, 23-25 and 38-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Motoki.

As stated above, Motoki teaches a GaN single crystal wafer substrate having a low dislocation density of less than less than $1 \times 10^6 \text{ cm}^{-2}$ with a surface area of 7.5 cm^2) and with a thickness of 0.7mm (700 micrometers).

Although, the Motoki reference doesn't disclosed the claimed crystal area, thickness or DDSDR of recited in claims 9, 14-16, 23-25 and 38-40, it would have been obvious to one of ordinary skill in the art to optimize these parameters (all result effective variables) through routine experimentation in order to create larger devices. It has been held that discovering an

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optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Motoki in view of US 2002/0189532 (Motoki '532).

As stated above, Motoki teaches a GaN single crystal wafer substrate having a low dislocation density. Motoki fails to teach the GaN nitride is doped with a dopant selected from silicon or oxygen.

Motoki '532 teaches that oxygen can be doped in to Gallium Nitride crystals and that oxygen is a safe n-type dopant for doping large GaN bulk crystals and that n-type gallium nitride crystals are suitable for producing LEDs and LDs (laser diodes) and other electronic devices (See paragraph 0002 paragraph 0059).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to add oxygen as a dopant as taught by Motoki '532 to the low dislocation density GaN single crystal wafer disclosed by Motoki because it would allow for suitable n-type doping for larger GaN bulk crystals.

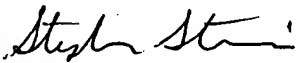
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Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Stein whose telephone number is 571-272-1544. The examiner can normally be reached on Monday through Friday from 8:30 a.m. to 5:00 p.m. If the attempts to reach the examiner are unsuccessful, the examiner's supervisor, Deborah Jones can be reached by dialing 571-272-1535. The official fax number is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

September 17, 2005



Stephen J. Stein
Primary Examiner
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